OPERATION & SERVICE MANUAL

1040L

Power Amplifier

HIGH RF VOLTAGES MAY BE PRESENT AT THE OUTPUT OF THIS UNIT. *All operating personnel should use extreme caution in handling these voltages and be thoroughly familiar with this manual.*

DO NOT USE ANY CFC (CHLOROFLUOROCARBON) SOLVENT IN THE MAINTENANCE OF THIS PRODUCT. In recognition of our responsibility to protect the environment, this product has been manufactured without the use of CFC's. The no-clean flux now used in all soldering operations may leave a small inert residue which will not affect the performance of the product. The use of CFC's for cleaning or maintenance may result in partial liquification of the no-clean flux residue, which will damage the unit and void the warranty.

This product is manufactured at ENI's Rochester NY plant, an ISO 9001 Quality System Certified Facility.

Notice

Revision Level: C2
Manual Order Number: 1040L-100

Warranty

ENI warrants to the original purchaser for a period of one year from the date of delivery, each instrument to be free from defects in materials and workmanship. For a period of one year, ENI will, at its option, adjust, repair, or replace defective parts, without charge to the original purchaser, so that the instrument performs according to its specifications.

When warranty service is required, the instrument must be returned, transportation prepaid, to the factory or to one of ENI's designated service centers. If, in our opinion, the instrument has been damaged by accident, unreasonable use, buyer-supplied software or interfacing, improper site preparation or maintenance, or abnormal conditions of operation, repairs will be billed at standard rates. In this case, an estimate will be submitted before the work is started.

THIS LIMITED WARRANTY IS EXCLUSIVE AND ENI MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, AND ALL OTHER EXPRESS ORAL OR WRITTEN WARRANTIES AND ALL WARRANTIES IMPLIED BY LAW, INCLUDING ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR OTHER WARRANTY OF QUALITY ARE EXCLUDED AND DISCLAIMED. IN NO EVENT SHALL ENI BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM BREACH OF ANY WARRANTY, WHETHER EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR FROM ANY CAUSE WHATSOEVER, INCLUDING NEGLIGENCE. Buyer's sole and exclusive remedy under this warranty shall be repair or replacement as set forth above, or if ENI is unable to repair or replace the defective part within a reasonable time, a refund of the price of the part or goods which give rise to the warranty claim.

Service And Technical Assistance

For Service or Repair contact the closest Customer Service Department with the following information:

- Model and serial number
- Purchase order number
- Detailed description of malfunction
- Your company's "Bill To" and "Ship To" address

You will receive a RMA (Return Materials Authorization) number, the warranty status of the unit to be returned and estimated repair charge, if any. The RMA number is your authorization number. Please type this number on your purchase order and shipping label. After ENI receives the unit, a firm quote and estimated date of completion will be given.

For Technical Assistance for your particular application, contact the nearest ENI Sales and Service Center. The following information will help us provide you with prompt and efficient service:

- All of the information contained on the unit's name plate.
- Names and telephone numbers of important contacts.
- Detailed description (i.e. physical damage and/or performance anomalies, quantitative and/or qualitative deviation from specifications), including miscellaneous symptoms, dates and times.
- The environment and circumstances under which the issue developed
- Supporting test data and/or records that can be provided.
- Any previous, related conversations and/or correspondence with ENI.

Sales & Service Locations

ROCHESTER, NY	A Division of Astec America, Inc. 100 Highpower Road Rochester, NY 14623 **Toll Free USA** **Service Hotline:**	Tel: (716) 292-7440 Fax: (716) 427-7839 Svc: (716) 292-7478 **1-800-724-ENI1 (3641)**
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GERMANY	Sielminger Str. 63 D-70771 Leinfelden- Echterdingen (Stetten) Stuttgart, Germany	Tel: (0711) 947 70 0 Fax: (0711) 947 70 25
JAPAN	541 Aoyogi Kunitachi Tokyo 186 Japan	Tel: (0425) 229 011 Fax: (0425) 222 636
TAIWAN	No. 15, Lane 24, Ming Hsiang 1 Street Hsinchu 300, Taiwan	Tel: (35) 787 762 Fax: (35) 787 760

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PRODUCT MANUAL REVISION CONTROL FORM

Title:	1040L	Part #:	1040L-100	Final Assy #:	1040L-1251
	Operation & Service Manual	Rev #:	C2	Eff. Date:	08/08/97

CONTENTS	DESCRIPTION	REV LEVEL
TEXT		B
SPECIFICATION		A
BOARD LAYOUTS		
SCHEMATICS		
1040L-SCH-01	1040L SCHEMATIC INDEX	A
1040L-SCH-02	1040L BLOCK DIAGRAM	A
1040L-SCH-03	1040L POWER WIRING	D
1040L-SCH-04	1040L DRIVER POWER SUPPLY	B
1040L-SCH-05	1040L POWER SUPPLY REGULATOR MODULE	A
1040L-SCH-06	1040L POWER AMPLIFIER MODULE	A
1040L-SCH-07	1040L METER CONTROL MODULE	C

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TABLE OF CONTENTS

REVISION LEVEL: B

This manual is divided into six chapters and two appendices. Please refer to the following descriptions to help you locate the information you need.

Chapter 1	Deals with precautionary details. Please read this section if you are unfamiliar with the 1040L or ENI's warranty procedures.
Chapter 2	Tells you how to install and power up the system for the first time.
Chapter 3	Describes operational details of the 1040L.
Chapter 4	This chapter provides a complete technical description of all the major components in 1040L.
Chapter 5	Provides maintenance and calibration procedures for 1040L.
Chapter 6	This chapter provides troubleshooting solutions to common problems in operating the 1040L.
Appendix A	This appendix provides complete operating specifications for the 1040L.
Appendix B	This appendix provides a drawings of the major circuit boards, schematics, and parts list used in 1040L.

Chapter 1

Safety

1.1 Labels

Labels are provided to alert operating and service personnel to conditions that may cause personal injury or damage to the equipment from misuse or abuse. Please read the labels and understand their meaning.

1.1.1 Important Operating or Maintenance Cautions

CAUTION !

The caution label is used in this manual, to caution the reader to important operating or maintenance instructions which could adversely affect the equipment reliability.

1.1.2 Shock Hazard Warnings

WARNING

The warning label is used in this manual to warn the reader of a procedure or practice which could result in personal injury if not followed carefully.

1.1.3 Service

CAUTION !

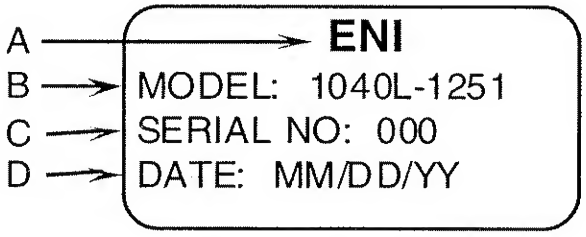
WARNING

ENI is responsible for safety, reliability, and performance of the equipment only if:

- *Assembly operations, extensions, readjustments, modifications, or repairs are carried out by authorized personnel.*
- *The electrical installation is made in accordance with the installation instructions provided and the room in which the equipment is installed complies with the environmental requirements.*
- *The equipment is used in accordance with the instructions for use.*

1.1.4 Name Plate

The 1040L can be identified by a name plate at the back of the unit which contains the following information.



1040L Identification Label

Figure 1.1.4

A. **Manufacturer:**
ENI
Rochester, NY USA

B. **Model:**
The assembly number which uniquely identifies product configuration is contained on this line.

C. **Serial #:**
This line contains a number which is sequentially assigned as the product is manufactured.

D. **Date:**
Proper identification of the date of manufacture is contained on this line.

Chapter 2

System Installation

2.1 Initial Inspection

2.1.1 Mechanical Inspection

If damage to the shipping carton is evident, request the carrier's agent be present when the unit is unpacked. Check for equipment damage and inspect the cabinet and panels for dents and scratches.

2.1.2 Claim for Damage

Please notify ENI directly or your authorized ENI representative if the 1040L is mechanically damaged or fails to meet specifications upon receipt. Retain our shipping carton and packing material for the carrier's inspection as well as for subsequent use to return the unit should this become necessary.

2.1.3 Packaging for Reshipment

Whenever possible, the original shipping carton and packing material should be used for reshipment. If the original packing material is not available, wrap the instrument in heavy paper or plastic. Use a strong shipping container. If a cardboard carton is used, it should be at least 200 lbs. test material.

Use shock-absorbing material around all sides of the instrument to provide a firm cushion and to prevent movement inside the container wall on each side. Protect the front panel by means of cardboard spacers inserted between the front panel and the shipping carton. Make sure that the instrument cannot move in the container during shipping. Seal the carton with a good grade of shipping tape and mark the container: **FRAGILE ELECTRONIC INSTRUMENT.**

CAUTION ! ***Drain water before shipment.***

2.2 Rack Installation

Rack-mounting brackets are supplied with the 1040L for installation in any standard, nineteen inch relay rack cabinet. To attach the brackets to the 1040L, remove the three #8-32 screws on each side of the cover nearest the front panel and reinsert them through corresponding holes located in the brackets. Tighten securely. The bottom feet may be unscrewed and removed if the minimum vertical usage of the relay rack is necessary.

2.2.1 Mains Voltage Settings

The supply voltage selection terminal strip, TB1, is located at the rear of the instrument. The voltage setting is determined by the location of the jumpers on terminal strip, TB1.

Accommodating the unit to the available AC line voltage is accomplished by connecting the AC line cord and jumpers to the correct terminals of terminal strip, TB1, in accordance with the Line Voltage Connections Table located below.

Disconnect the line cord from the power main when adjusting the operating voltages. Failure to connect jumpers to their proper terminals may result in severe damage to the instrument.

Nominal Line Voltage	Line Hot (Black)	Line Common (White)	Jumpers	
			Black	White
115 VAC	5	3	1-4	2-5
230VAC	5	1	Remove	2-3

Line Voltage Connections

Table 2.2.1

2.2.2 Mains Fuse Rating

The mains fuse F1 is located on the rear panel. The following information is provided should replacement become necessary.

115VAC	15A	SLOW BLOW	ENI P/N 10293
230VAC	8A		ENI P/N 10290

2.2.3 Mains Lead Connection

For 230VAC operation, a suitable mains supply plug must be fitted to the mains lead attached to the instrument. The three conductors are coded as follows:

BLACK	-Live
WHITE	-Neutral
GREEN	-Earth

2.3 Initial Turn On Procedure

1) Flip the AC switch, located on the left side of the front panel, to the ON position Proper connection of the Model 1040L to the AC line is indicated by the lamp labeled AC.

2) Connect the output of an appropriate signal source (signal generator, function generator or oscillator) to the INPUT connector on the Model 1040L. Initially, the input level should initially be kept below 1V peak-to-peak.

3) Connect a 50Ω coaxial cable between the output connector of the Model 1040L and the load. Place the METER switch, located below the output meter, in the FORWARD position. The output power meter will indicate the power being **delivered** to the load. In the LOAD position the output power meter indicates power is being **absorbed** by the load. The difference between these two readings is the reflected power which is absorbed in the amplifier. If the reflected power exceeds 70W, the Model 1040L will automatically cut-out and the OVERLOAD lamp will light. In order to reset the 1040L, the input signal should be reduced and the OVERLOAD button, part of the overload lamp, should be depressed.

   Under certain load mismatches or cooling-system failures the Model 1040L will cut-out due to overheating. When this occurs the OVERLOAD lamp will light. This condition cannot be reset from the front panel but will automatically reset upon cooling of the amplifier heatsinks. Reset should occur within two minutes.

Note: *If the output is allowed to exceed 500W the AC fuse may blow and shut down the unit.*

Now that the front panel controls and indicators are understood, the input signal voltage can be increased until the required power output is delivered to the load.

Note: *Do not, under any circumstances, increase the input level beyond 4V peak-to-peak or permit the signal source frequency to extend below 6kHz. Severe damage may result from these actions.*

2.4 Performance Check

The electrical performance of the Model 1040L should be verified as soon as possible after receipt. Performance of the following procedure will verify that the Model 1040L will deliver more than 400W of power over the frequency range of 10kHz to 500kHz:

1) Connect an appropriate signal generator to the input of the Model 1040L.

2) Connect the Model 1040L output to a 30dB, 2000W attenuator (Bird 8329 or equivalent). If a calorimetric wattmeter (HP434A or equivalent) is available, connect the output of the attenuator to its input.

3) Set the signal source to CW, output level to approximately 1.5V peak-to-peak and frequency to 500kHz. Increase the input signal until 400W is indicated on the 1040L output power meter.

4) Slowly decrease the frequency while observing the power meter. Note that at every frequency down to 10kHz, the power output is in excess of 400W. Power indicated on the 1040L meter should be within ±3 percent of that indicated on the calorimeter.

2.5 Tuning the Load

To operate the Model 1040L at its maximum efficiency the load impedance should be as close to 50Ω resistive as possible. Tuning the load to 50Ω is a simple matter using the 1040L power meter. The following procedure is useful in tuning a piezoelectric or magnetostrictive transducer.

1) Place the transducer into an actual mechanical operating environment.

2) Set the input level of the 1040L so that forward power is 100W or less.

3) Observe the load power while tuning the operating frequency for resonance. At resonance the load power will be maximum.

4) Using a variable reactive tuning network or element (capacitance for magnetostrictive and inductive for piezoelectric) tune for maximum load power. At maximum load power all of the reactance has been tuned out and the load is pure resistive.

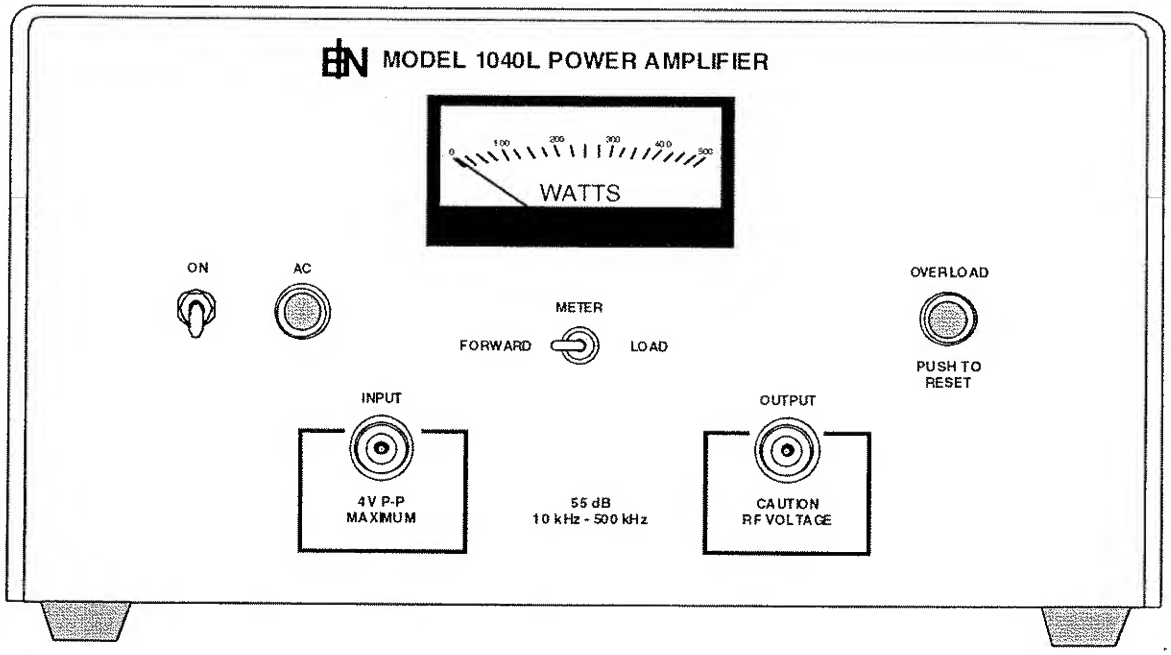
5) If there is still a substantial difference between the forward power and the load power, a tapped transformer (step-up or step-down, depending on load resistance) should be connected between the 1040L and the transducer. Change the transformer taps in the direction of increasing load power. Impedance is 50Ω resistive when the load power equals forward power.

   Further information on transducer matching, available transformers, and bias supplies may be obtained by contacting the ENI Engineering Department.

Chapter 3

1040L Operation

It is important to understand the function of each device and connection before attempting operation. Figure 3.1 illustrates all of the front panel devices and connections; text throughout the remainder of this section provides a functional description of each device and connection.



1040L Front Panel
Figure 3.1

3.1 Front Panel Devices & Connections

3.1.1 AC Power On/Off Toggle Switch

The front panel AC Power toggle type switch provides On/Off AC power control. The amplifier is "ON" when the toggle switch is in the up position. The amplifier is "OFF" when the toggle switch is in the down position.

3.1.2 Analog Front Panel Meter

Depending upon the position of the front panel METER, FORWARD/LOAD meter select toggle switch, the analog front panel meter (500W full-scale) indicates either (1) the RF output power level being produced by the amplifier or (2) the RF power level being absorbed by the load.

3.1.3 Forward/Load Meter Select Toggle Switch

The Forward/Load Meter Select Toggle Switch on the front panel allows the user to select the front panel meter indication from forward and load RF power level options.

3.1.4 AC On Light

The AC On light indicates whether AC Power is on or off. When the AC light is lit, there is AC Power to the amplifier. When the AC light is extinguished, there is no AC Power to the amplifier.

3.1.5 Overload Light/Reset Button

The Overload Reset Button is used if the reflected power exceeds 70W. If that occurs, the amplifier will automatically shut off and the Overload Light will be turned on. To reset the 1040L, the Overload Reset Button needs to be pressed.

3.1.6 Connectors

The following connectors have been provided for system interfacing through the front panel.

- RF Input
- RF Output

RF Input

The RF Input connector provides connection to the driving generator through this female, Type 'BNC' connector. Input impedance is 50Ω nominal.

CAUTION ! *No more than +16dBm (1.414Vrms) should be applied to the RF INPUT port. Do not connect RF amplifier output to input port since RF oscillation can occur damaging the amplifier.*

RF Output

The RF Output port provides connection of the amplifier system to the load through this female, Type 'BNC' connector. Output impedance is 50Ω nominal. The RF Output port is protected into all phases of any load VSWR. The amplifier will deliver RF Power into any load impedance between 40 and 60Ω resistive.

WARNING ϟ *"**Caution RF Voltage**"*
Indicates that an AC potential of up to 45V peak may appear between the center pin of the Type 'BNC' connector and ground. Normal caution should be exercised when working with these voltages.

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Chapter 4

Technical Description

4.1 General Description

The Model 1040L is designed to amplify signals by 55dB in the frequency range of 10 to 500kHz. The signal from the front panel connector is fed via a length of 50Ω coaxial cable to K3, Pin 3 on the relay control module (1040L-4254; see schematics). Relay K3, Pins 3 and 9 are in the normally closed position when K3 is not energized, thus allowing the input signal to pass through the power supply/driver module (1040L-4252). The input signal at J4 is coupled by C1 to the base of low noise transistor, Q4. The amplified signal at the collector of Q4 is matched, split and phase reversed by transformer T1. Two equal-amplitude phase reversed signals are fed to the bases of Q5 and Q6. The power outputs of Q5 and Q6 are combined and matched in phase reversing transformer T2. The power at T2 is then fed via a length of 50Ω coaxial cable to transformer T7. The signal at transformer T7 is matched, split and phase reversed into two equal amplitude signals. These signals are then fed to the inputs of the two power amplifier modules.

At each of the two power amplifier modules (1040L-4253), hybrid transformers T1,T2 and T3 split the signal into four equal-phase and amplitude signals. These signals are fed to the bases of eight final power amplifier transistors (Q14-Q21). These transistors are arranged to form four parallel sets of two.

The outputs at the collectors of each pair are fed through their associated fuses to combining hybrids T4, T5, and T6. Fuses (F1-F4) protect the DC power supply should a transistor failure occur. The outputs from the two power amplifier modules are fed to phase reversing transformer T6 where they are combined and matched to form a 50Ω output at J8.

The meter control circuit (1040L-4257) which is connected to the output of the 1040L measures both forward and load power. A front panel switch (S3) selects either the forward or actual load power on the meter display. This is accomplished passively by a three transformer matrix (T1-T3) which uses a broadband ferrite loaded transmission line coupling mechanism. The output of this matrix is divided into two channels for final computation in an integrated circuit multiplier. The output of the multiplier drives the meter display.

The 1040L is designed to withstand 70W of reflected power. Should the reflected power exceed 70W, a +1VDC potential is developed across R8 on the meter control module. This +1VDC is sent to Pin 1 on Relay K2. This energizes K2 which, in turn, energizes K3. With K3 energized, DS2 illuminates and the input signal path is broken, placing the unit into an overload condition. Reducing the input drive level and depressing the overload reset switch (S2) will make the unit operational once again. In an overheat condition, normally open thermal switch TS1 will close which also opens the input signal path and illuminates DS2. Depressing overload reset switch S2 will have no effect in the overheat mode. After approximately two minutes the unit will automatically reset itself.

The amplifier power requirements are 115 or 230VAC at 1500W. Regulated DC is supplied by series pass transistors Q9-13 (1040L-4255), driven by Q8 in a Darlington arrangement. Voltage control and feedback are provided by Q1, Q7 (1040L-4252) and their associated components. The power supply voltage is adjusted to +96VDC by R20. The regulated +96VDC output of the power supply is also fed to Q2 and Q3 which, in turn, provide the lower working voltage for the driver amplifier.

Chapter 5

Maintenance & Calibration

5.1 Introduction

The ENI 1040L power amplifier requires no periodic maintenance. The instrument is unconditionally stable and is fail-safe under all load conditions. Damage can only be externally caused by the incorrect selection of the supply voltage or by an input signal in excess of the specified 4V peak-to peak maximum. Therefore, this chapter deals only with certain fundamental procedures for fault location and with subsequent realignment procedures.

Note that quoted performance limits are for guidance only and should not be mistaken for guaranteed performance specifications.

5.2 Functional Description

The Model 1040L RF Power Amplifier is constructed on a modular basis so that practically every module is readily accessible from the front, sides and top of the unit. To facilitate and enhance servicing, the entire amplifier section is constructed on a removable, "U" shaped chassis. The 1040L consists of six distinct assemblies; location and description of each assembly follows below:

ASSEMBLY	LOCATION	FUNCTION
Power Amplifier 1040L-4253	The two power amplifier modules are located on the right side of the amplifier "U" chassis. The power amplifiers are connected to the external circuitry by multi-pin connectors located at the top of the modules.	Increased output of the power supply and driver module to the full power output of the unit.
Power Supply/Driver 1040L-4252	The power supply/driver module is located on the top of the left-hand side of the "U" assembly.	Provides pre-amplification to the power amplifiers and also provides regulated DC voltage source a regulated source of DC voltage to the entire unit.
Power Supply Regulator 1040L-4255	The power supply regulator is located on the left side of the "U" assembly below the power supply/driver module.	Supplies regulated DC voltage to the power amplifier modules.
Meter Control 1040L-4257	The meter control module is located on the left front of the "U" assembly.	Monitors the output power of the unit and provides control signals to the overload relays, located in the relay control module.
Relay Control 1040L-4254	The relay control module is located on the main chassis at the center front of the unit.	Provides control to the input signal line so that any overload condition will be safely eliminated.
RF Choke Assembly 1040L-3255	The RF choke assembly is located on the main chassis at the center rear of the unit.	Isolates the AC line from RF current.

5.3 Transistor Replacement

WARNING ***Disconnect amplifier from AC power source before removing panels.***

5.3.1 Top Cover Removal

Remove the 1040L top cover by unscrewing the four screws located on each side of the unit.

5.3.2 Faulty Transistor Identification

Observe the two power amplifier modules 1040L-4253, located on the right side of the inverted "U" assembly.

Each module has four visible fuses. If any of the fuses has been blown (this condition is clearly visible) then the associated power transistors should be replaced to achieve full, specified power output. The two transistors are in a vertical line, about 0.5 inches to the left of the blown fuse.

5.3.3 Inverted "U" Assembly Removal

In order to replace the faulty transistors the inverted "U" assembly must first be detached and removed from the baseplate as follows:

1) Remove the front panel by releasing its four mounting screws.
2) Remove the subminiature plug and the multi-pin connector associated with the "U" shaped assembly from the relay control module, 1040L-4254.
3) Unplug the dual pin connector located at the rear left of the unit.
4) Remove the six, #8-32 screws which hold the inverted "U" assembly to the baseplate. Carefully lift the inverted "U" assembly straight up.

5.3.4 Power Amplifier Module Removal

1) Remove the power amplifier module 1040L-4253 by removing the four, #4-40 screws located about .5 inches to the left of each fuse. Also remove the four #4-40 screws located at each corner of the module.
2) Pull apart the 9-pin strip connector located at the top of the module.
3) Pull the power amplifier module straight out from the inverted "U" assembly.

5.3.5 Power Amplifier Transistor Replacement

1) Remove the four #4-40 screws and associated hardware from the defective transistors.

CAUTION ! *Be sure that the mica washer is placed between each transistor and the P.A. Heatsink Assembly. Also be sure to place the nylon shoulder washer over each screw on the outside of the heatsink before the metal hardware is replaced.*

2) Remove the defective transistors and replace them with two new transistors (MJ16010 or equivalent).

3) Tighten the #4-40 screws until the transistors are held securely.

4) To replace the power amplifier module (1040L-4253), carefully align the eight transistor sockets and pins on each of the transistors and press module down until it sits on the eight, #4-40 spacers on the P.A. heatsink assembly.

5) Replace all screws removed in Step 1.

6) Replace previously blown fuse with a new 3 AG, 250V, 3.0A fuse.

7) Replace the inverted "U" assembly on the baseplate and secure. Replace connectors and plug previously removed.

8) Replace the cover and tighten all associated hardware.

Chapter 6

Troubleshooting

The first step in isolating a malfunction is to review the conditions under which the symptoms were observed, verifying causes may not be attributed to external cabling, transducer failure or external electrical problems.

Commonly found symptoms, probable causes, and recommendations for troubleshooting are listed in the following **Troubleshooting Guide.**

Troubleshooting Guide		
Symptoms	**Probable Cause**	**Recommendations**
Fan does not run with switch in the ON position	Main line fuse is insufficient to handle the current draw.	Make sure line fuse or circuit breaker has minimum capacity of 15A at 115V or 8A at 230V.
Overload light comes on during amplifier operation.	Output load is improperly tuned.	Follow tune-up procedure of Section 2.5.
	Output coaxial cable is defective.	Check and repair output cable.
Mains fuse blows during amplifier operation.	Excessive power output level.	Reduce output level.
Push-to-Reset button does not turn Overload light off.	Amplifier has overheated and thermostatic control has taken over.	Allow unit to cool down. Overload light will turn off automatically. Check to see that the fan is turning and intake is free of obstructions or dirt build-up.
		Check input air temperature to see that it is not excessive.
		Check the output load tuning.
		Reduce the output level.
Output power indication increases from cold start.	Normal operation	Let unit run for five minutes to eliminate drift due to amplifier warm up.
Power output is below normal for a given level setting.	Load mis-tuning	Check for mis-tuning.
	Faulty transistors	Check for blown fuses on P.A. circuit module 1040L-4253. Blown fuses may indicate faulty transistors. Replace (see Section 4.4.4 and 4.2) or return to factory.

Appendix A

1040L Specifications

The following appendix lists complete physical and operations specification for the 1040L.

1040L Specifications

Revision Level: B

Class of Operation	Class B
Frequency Range	10 to 500kHz
Gain	55dB nominal
Gain Flatness	±1dB
Drive Source Requirement	Any signal generator, function generator or oscillator capable of up to 0.7Vpp output into 50Ω.
Ruggedness	Any load VSWR, any phase, from open to short circuit, without damage
Rated Power Output	400W
Input Impedance	50Ω
Matched Output Load Impedance	50Ω; the amplifier will supply full power to any load impedance between 40 and 60Ω, resistive.
Thermal Protection	Automatic cutout is provided should the power transistors overheat due to load mismatch or cooling system failure. Automatic reset upon cooling.
Stability	Unconditional
Front Panel Meter	True average reading voltmeter indicates 0-500W into 50Ω. Front panel switch permits measurement of forward power (power leaving the amplifier) and load power (power absorbed by the load).
Operating Temperature	0° to 45°C ambient
Primary Power Required	115V/230VAC, ±6%, 15A/8A, 50-60Hz
Protection	INPUT: Unit will withstand an input signal of +16dBm (1.414 Vrms) max.

Mismatch Protection	The unit will tolerate up to 70W of power reflected from any load impedance, subject to operation of thermal protection. Instanteous cut-out is provided should the load mismatch exceed allowable limits.
Front Panel Controls	AC Power On/Off, Forward/Load Meter Select, Overload Reset
Front Panel Indicators	AC On, Power (Forwar/Load), Overload
Front Panel Connectors	RF Input/Output (Type BNC)
Rear Panel Connector	AC rear panel linecord
Size*: **(H x W x D)**	8.75 x 15 x 19.6" *(222 x 381 x 498mm)* **excluding handles, connectors and feet*
Weight:	56 lbs. *(25.4 kg.)*
Rack Mounting	19 inch rack mount adaptors are provided.

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Appendix B

Service Appendix

This appendix provides drawings and schematics of the major circuit boards plus a parts list for 1040L.

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INDEX
1040L SCHEMATIC DIAGRAM

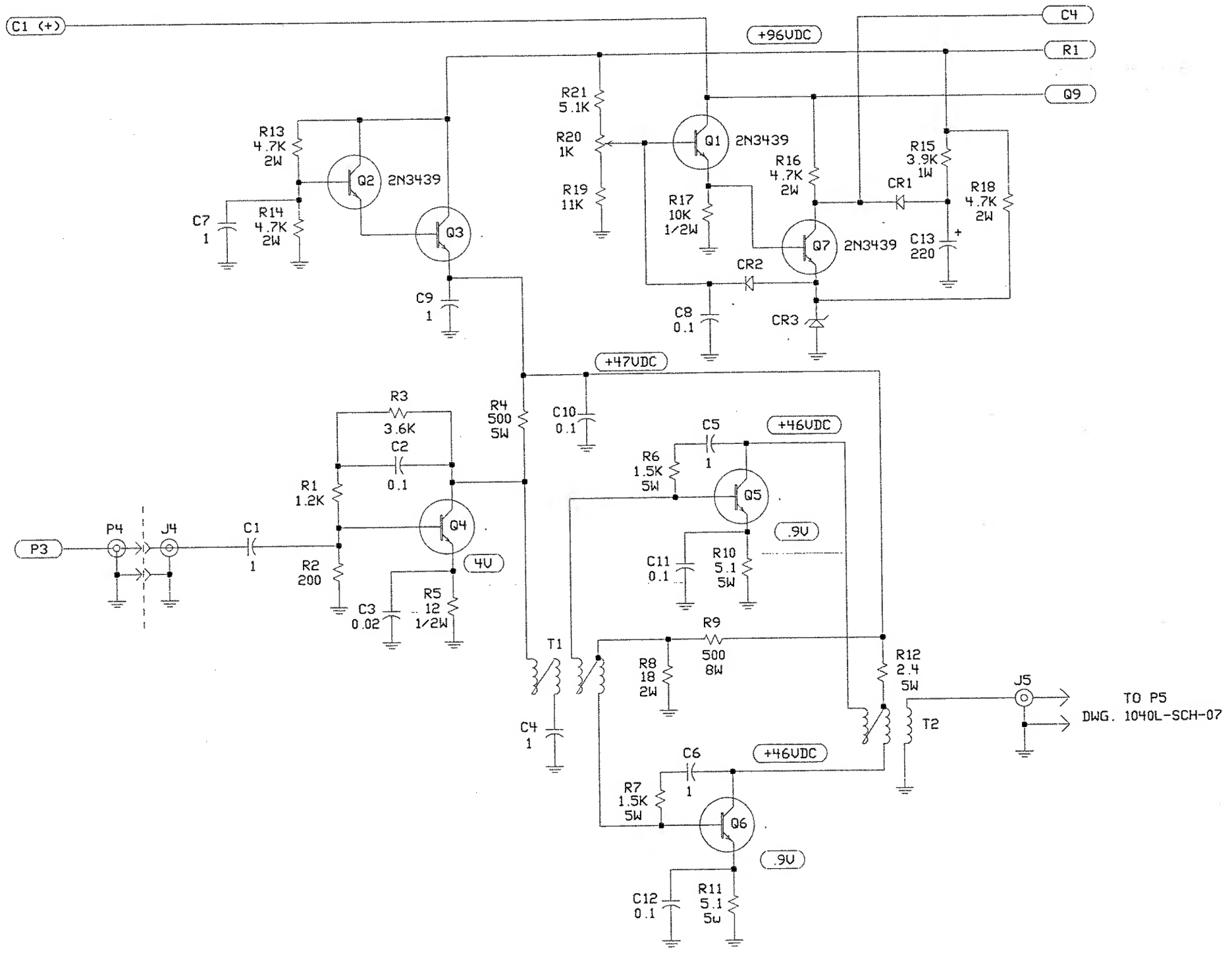
DRAWING NAME	REFERENCE DWG.	FILE NAME
1040L BLOCK DIAGRAM	1040L-SCH-02	BLK-DIA
1040L POWER WIRING	1040L-SCH-03	PW
1040L DRIVER POWER SUPPLY	1040L-SCH-04	DPS
1040L POWER SUPPLY REGULATOR MODULE	1040L-SCH-05	PSRM
1040L POWER AMPLIFIER MODULE	1040L-SCH-06	PAM
1040L METER CONTROL MODULE	1040L-SCH-07	MCM

NOTE: THIS DOCUMENTATION WAS GENERATED WITH THE HIWIRE SOFTWARE PACKAGE. THE DISKETTS FOR THESE FILES ARE ARCHIVED IN THE VAULT.
DISK NAME: 1040L
REFERENCE DWG. 1040L-SCH-01
FILE NAME: INDEX

REV	DESCRIPTION	APPROVED	DATE	REV	DESCRIPTION	APPROVED	DATE
				A	REVISED AND REDRAWN ON CAD.	[signature]	11/26/96

ENI
ELECTRONIC NAVIGATION INDUSTRIES INC.
100 HIGHPOWER ROAD
ROCHESTER, NEW YORK 14623

DRAWN FVC	DATE 10-90	INDEX	
CHK. [signature]	11-96	1040L	
ENG. [signature]	11-96	DWG. NO. 1040L-SCH-01	REV A
APP. [signature]	11-96	SHEET 1 OF 1	



DRIVER POWER SUPPLY
1040L-4252

NOTE:DOCUMENTATION GENERATED ON CAD USING THE HIWIRE II SOFTWARE PACKAGE. THE FILES ARE STORED ON THE NETWORK. FILE NAME:1040L4B1.SCH
REFERENCE
1040L-SCH-03 DESIG. C1(+),P3
1040L-SCH-05 DESIG. C4,R1,Q9
1040L-SCH-07 DESIG. J5

REV	DESCRIPTION	APPROVED	DATE
A	REV. AND REDRAWN ON CAD, ORIG. DESTROYED	JMG	11/90
B	ECO 6448 CHG C13 VALUE FVC		12/9/94

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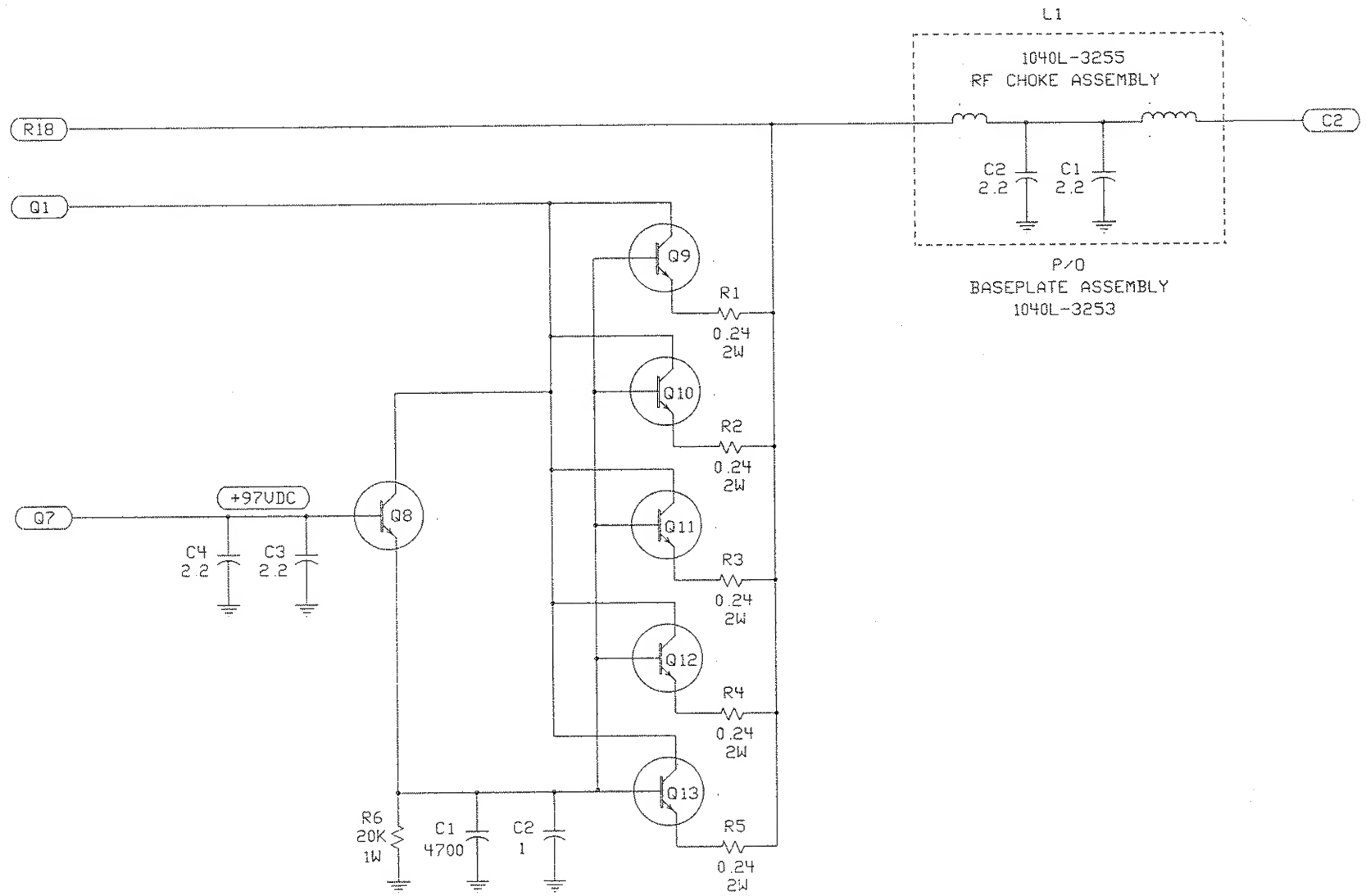
A DIVISION OF ASTEC AMERICA, INC.
100 HIGHPOWER ROAD
ROCHESTER, NEW YORK 14623

DRAWN	FVC	10/90
CHK.	JMG	11/90
ENG.	JMG	11/90
APP.	JMG	11/90

DRIVER POWER SUPPLY
SCHEMATIC DIAGRAM
1040L

DWG. NO. 1040L-SCH-04 R

SHEET 1 OF 1



1040L-4255
POWER SUPPLY
REGULATOR MODULE

REFERENCE
1040L-SCH-04 DESIG. R18,Q7
1040L-SCH-03 DESIG. C1(+)
1040L-SCH-07 DESIG. C2

REV	DESCRIPTION	APPROVED	DATE
A	REV. AND REDRAWN ON CAD, ORIG. DESTROYED		

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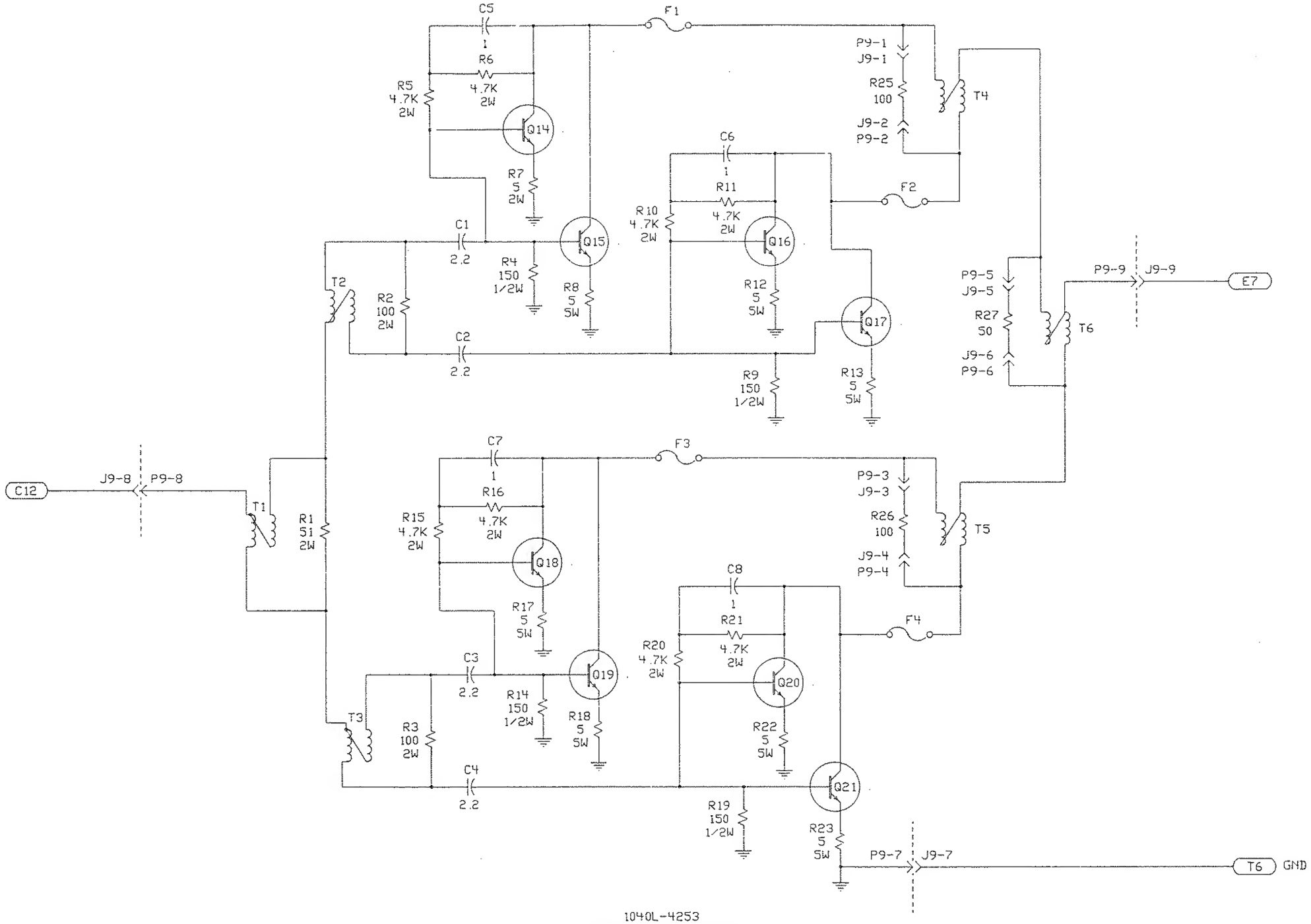
100 HIGHPOWER ROAD
ROCHESTER, NEW YORK 14623

DRAWN FVC	DATE 10/90	POWER SUPPLY REGULATOR MODULE SCHEMATIC DIAGRAM 1040L
CHK.		
ENG.		DWG. NO. 1040L-SCH-05 REV A
APP.		SHEET 1 OF 1



REFERENCE	REV	DESCRIPTION	APPROVED	DATE	REV	DESCRIPTION	APPROVED	DATE
10401-SCH-07 DESIG. C12,C13,T6					A	REV. AND REDRAWN ON CAD, ORIG. DESTROYED		

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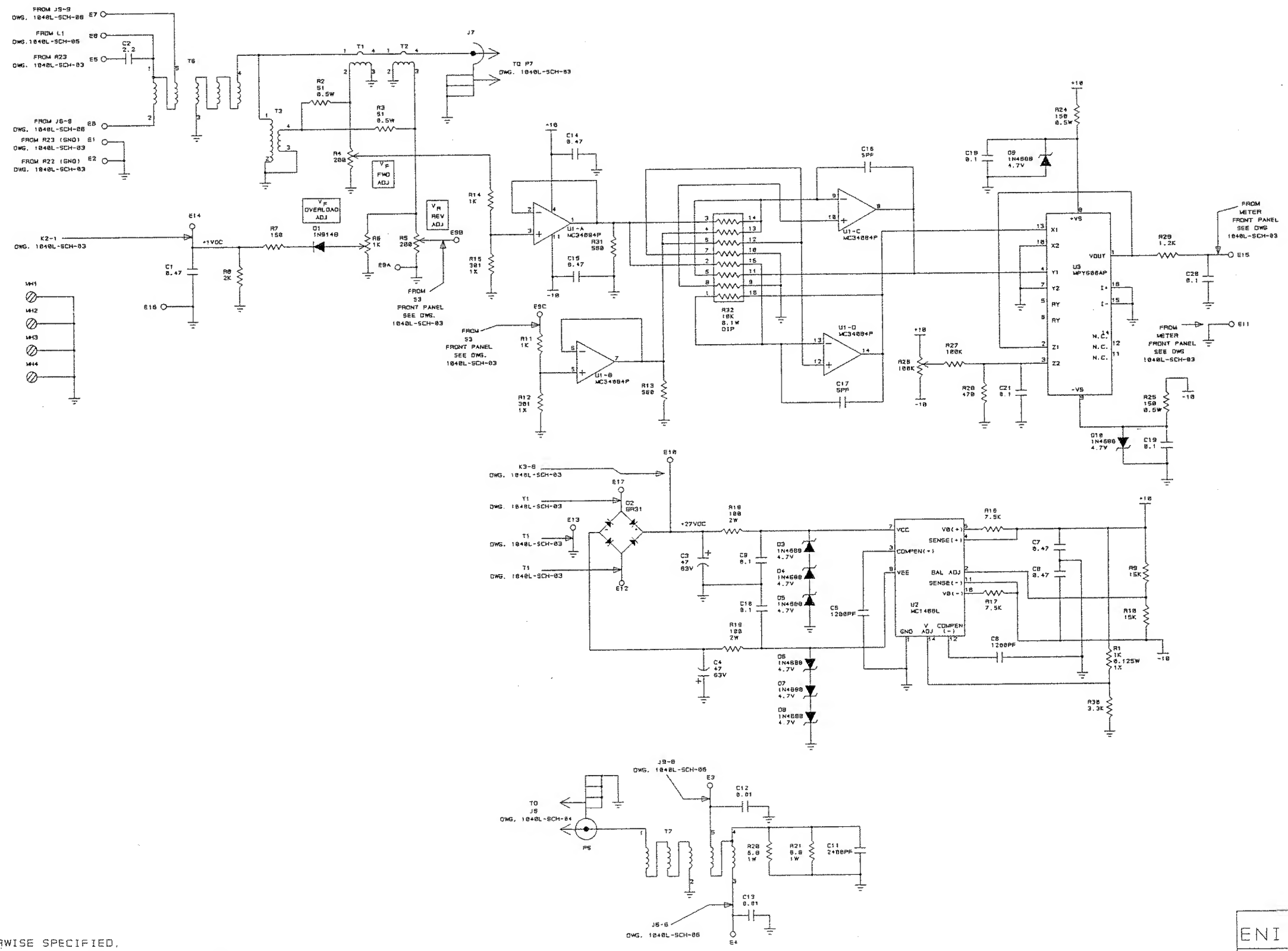
100 HIGHPOWER ROAD
ROCHESTER, NEW YORK 14623

DRAWN FUC	DATE 10/90	POWER AMPLIFIER MODULE SCHEMATIC DIAGRAM 1040L	
CHK.			
ENG.		DWG. NO. 1040L-SCH-06	REV A
APP.		SHEET 1 OF 1	



NOTES:

1. UNLESS OTHERWISE SPECIFIED,
   A. ALL RESISTOR VALUES ARE IN OHMS, 1/4W, 5%
   B. ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. LAST DESIGNATOR USED: C21, R32, D10, U3, T7, E17
3. DESIGNATORS NOT USED: T4, 5, R22, 23

REV	DESCRIPTION	DATE	CHK	APRV
C	ECO 3917	5-91		
B	REV. AND REDRAWN ON CADSTAR, ORIGINAL DESTROYED	11-90		
A	ECO 2771	6-90		

ELECTRONIC NAVIGATION INDUSTRIES INC.
100 HIGHPOWER ROAD
ENI ROCHESTER, NEW YORK 14623 (716)427-8300

DRAWN	F. CLEMMONS
DATE	6 NOV 90
DESIGN	1/28/94
DEV.	1/28/94
CHECK	1/28/94
APPROVAL	
FILENAME:	MCM.CSD

DESCRIPTION
METER CONTROL BOARD
SCHEMATIC DIAGRAM
1040L

DWG. NO. 1040L-SCH-07 REV C

SHEET 1 OF 1

GLOSSARY OF ABBREVIATIONS

A	AMPERES
AMP	AMPERES
ASSY	ASSEMBLY
BR	BRIDGE
CAP	CAPACITOR
CER	CERSMIC
DESIG	DESIGNATION
ELECT	ELECTROLYTIC
FWD	FORWARD
IC	NTEGRATED CIRCUIT
K	KILOHMS
KO	KILOHMS
mV	MILLIVOLTS
pF	PICOFARAD
PIV	PEAK INVERSE VOLTAGE
PWR	POWER
POT	POTENTIOMETER
REF	REFERNCE
REQ	REQUIRED
RFL	REFLECTED
RES	RESISTOR
S.B.	SLOW BLOW
uF	MICROFARAD
µF	MICROFARAD
uH	MICROHENRY
µH	MICROHENRY
V	VOLTS
VDCW	DC WORKING VOLTAGE
W	WATTS
WW	WIRE WOUND